

Natural Gas Research Energy Resources Program of the U.S. Geological Survey

Thaddeus S. Dyman (dyman@usgs.gov; 303-236-5730)
Timothy S. Collett (tcollett@usgs.gov; 303-236-5731)
Robert D. Hattinger (rhetting@usgs.gov; 303-236-7770)
Ronald C. Johnson (rcjohnson@usgs.gov; 303-236-5546)
Vito F. Nuccio (vnuccio@usgs.gov; 303-236-1654)
Jennie L. Ridgley (ridgley@usgs.gov; 303-236-9048)
Robert T. Ryder (rryder@usgs.gov; 703-648-6492)
James W. Schmoker (schmoker@usgs.gov; 303-236-5794)
Craig J. Wandrey (wandrey@usgs.gov; 303-236-5341)
U.S. Geological Survey
P.O. Box 25046, MS 939
Denver, CO 80225

Abstract

The Natural Gas Studies Group (NGSG) of the Energy Resources Program of the U.S. Geological Survey conducts geologic research dealing with the origin, occurrence, and assessment of natural gas resources. Activities include collecting, synthesizing, and interpreting data to predict the distribution, quantity, quality, and availability of natural gas resources. The results of NGSF framework and process studies are integrated with newly-developed assessment methods to estimate the undiscovered resources of natural gas plays and the reserve-growth potential of known fields. Research is conducted on a topical and geographic basis and is subdivided into five current projects: (1) Continuous-Type Gas Accumulations, (2) Discrete Versus Continuous-Type Gas Accumulations, (3) Gas Hydrate Accumulations, (4) Coalbed Gas Accumulations, and (5) Rocky Mountain Basins Gas Projects.

The Continuous-Type Gas Accumulations Project addresses large, potentially gas-productive areas that cannot be defined in terms of discrete fields with down-dip hydrocarbon-water contacts. Our definition of continuous-type (unconventional) accumulations is based solely on geologic characteristics rather than on arbitrary government regulations. This project presently focuses on gas potential in Lower Silurian reservoirs in the Appalachian basin and Cretaceous shallow biogenic gas reservoirs of the northern Rocky Mountain region. Appalachian basin studies include: (1) synthesizing the geologic framework and production histories of Clinton/Medina sandstone reservoirs in order to better understand the unconventional gas potential of the basin; (2) developing geophysical log-response models for identifying the presence of gas across a continuous-discrete accumulation boundary; and (3) integrating geologic and production data to better understand the distribution of gas accumulations in under pressured reservoirs. Northern Great Plains shallow biogenic-gas studies include: (1) updating analog relations between U.S. and Canadian portions of the accumulation by incorporating new Canadian drilling results from well databases; (2) integrating geologic and production data for both Canada and the

U.S. to better understand the origin, evolution, and distribution of biogenic gas accumulations; and (3) developing log-response models for identifying the presence of continuous-type gas.

Objectives of the Discrete Versus Continuous-type Gas Accumulations Project include: (1) identification of the continuous versus discrete nature of gas accumulations in reservoirs such as the Lower Silurian Clinton-Medina of the Appalachian basin, Cretaceous of Rocky Mountain basins and northern Great Plains; (2) analysis of gas reservoir behavior using measures of production rates and ultimate production from individual wells and reservoirs for Morrow Sandstone reservoirs in the Midcontinent; (3) improvement of methodologies for analyzing the difference between continuous-type and discrete accumulations; (4) development of models describing the nature and significance of reserve growth for large known gas fields; (5) review of the economic analysis for the 1995 U.S. Geological Survey National gas assessment; and (6) development of new models for gas availability based on studies of exploration efficiency.

The primary objective of the Gas Hydrate Accumulations Project is to assess the availability and production potential of gas hydrates on the North Slope of Alaska. The gas hydrate assessment is focusing on the known gas hydrate accumulation in the Prudhoe Bay area which contains more than 40 TCF of gas in place. Hydrate production studies emphasize determination of the production characteristics and recoverability of the Prudhoe Bay accumulation. Current activities include (1) acquisition of high resolution temperature and borehole gravity surveys for existing wells; (2) review of seismic data to assess the distribution of hydrates; and (3) an industry/government research coring and production testing program. A proposed multi-organizational project is being designed to analyze scientific and engineering properties of gas hydrate accumulations in the Western Operating Area of the Prudhoe Bay Field.

Coalbed Gas Project research includes: (1) identifying the geologic and hydrologic factors dealing with the generation, migration, and production of coalbed gas in the Wasatch Plateau; (2) evaluating controls of occurrence and recoverability of coalbed gas in the San Juan basin, and working with other Federal agencies and the States of New Mexico and Colorado in evaluating the resource potential and environmental issues of coalbed gas development; and (3) modifying and evaluating methods for estimating undiscovered coalbed gas resources, and defining new potential plays and reassessing coalbed gas plays resulting from the 1995 U.S. Geological Survey National Petroleum Assessment.

The Rocky Mountain Basins Gas Project is presently focusing on the following activities in the Wind River and Bighorn basins: (1) developing a new gas resource assessment methodology to determine the in-place and recoverable gas resources; (2) describing the relationship between faulting and the location of deep continuous-type gas accumulations and shallow discrete accumulations using geochemical isotopic data; and (3) analyzing the gradational relationship from continuous low-permeability reservoirs to discrete reservoirs with conventional permeabilities.

These five NGSF projects are strongly interrelated, and together form a broad-based natural gas resources research program that addresses current and important themes in energy science.